B2

Cooperative Extension Service
University of Illinois at Urbana-Champaign, College of Agriculture

Horticulture Facts

Growing Sprouts Indoors

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VC-13-80
(Rev. 4/81)

Sprouting various kinds of seeds indoors for food purposes is a rather simple process, but one that does require a few minutes of time each day to assure success.

A sprout is the shoot of a germinated seed. Sprouts are a good source of protein, vitamins, and minerals. Sprouts are particularly rich in vitamins B_1, B_2, and C.

The most commonly used means of sprouting seeds is the "rinse and drain" method. In addition to the seeds, you need a glass jar and some cheesecloth. (A wide-mouth canning jar with a screw-top ring is ideal.) The seeds often used for sprouting include those of the mung bean, soybean, lentil, and alfalfa. When buying seeds for this purpose, get only those that are sold expressly for use in sprouting. Be sure they have not been treated with a fungicide or with any other material. Health food stores and the gourmet departments in supermarkets usually stock such seeds.

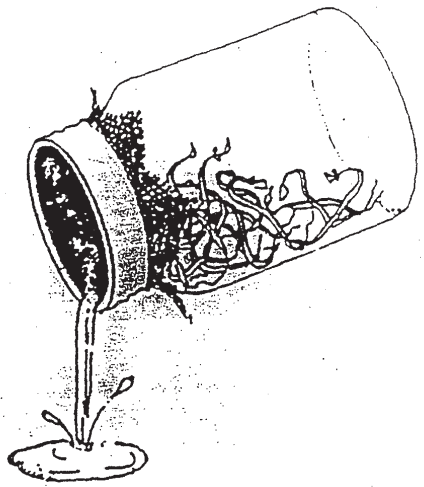

Figure 1

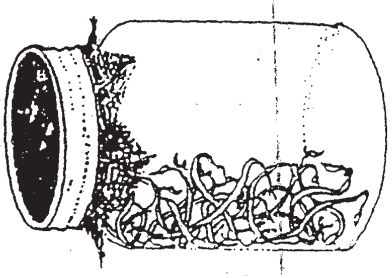

Figure 2

Sprouting the seeds is a 5-step process:

1. Prepare your sprouting jar by cleaning it thoroughly. Cover the bottom with 1/2 to 1 inch of seeds. Cover the mouth of the jar with a piece of cheesecloth. Secure it with a rubber band or a screw-top ring.
2. Rinse the seeds with cold water and drain them. The cheesecloth will keep the seeds in the jar as you pour off the water (Figure 1).
3. Soak the seeds in lukewarm water for 12 to 16 hours. The volume of water in the jar should be twice that occupied by the seeds.
4. Drain off the water. Then rinse the seeds with lukewarm water and drain them thoroughly.
5. Place the jar on its side to distribute the seeds evenly (Figure 2). Keep the jar in a dark place at room temperature (68° to 72°F is ideal).

Some people grow sprouts in the light. However, this allows them to turn green and possibly become tough and bitter.

Continue to rinse the seeds 2 to 4 times a day until the sprouts are the desired length, usually 2 to 5 days. Always be sure to drain off all excess water. Otherwise, the seeds will ferment and spoil.

The sprouts will be ready within a few days. Wash them thoroughly to remove the seed husks. Sprouts can be used in salads and on sandwiches, stir-fried, or cooked in vegetable dishes, soups, stews, and casseroles. Unused sprouts may be kept in a sealed bag or jar in the refrigerator for 1 to 2 weeks.

To freeze sprouts, blanch them over vigorous steam for 3 minutes, then cool quickly in ice water, drain, and pack the sprouts into containers that can be sealed

Drawings by Floyd A. Giles, Department of Horticulture

Exhibit 1-G(i)

Sprouters' Guide--a list of suggested seeds that you can sprout and information regarding methods, yield, and use.

Seed	Desired sprout length	Average sprouting time	Sprout yield (for desired lengths) seeds used	Sprout yield (for desired lengths) sprouts obtained	Proper sprouting method	Can be eaten raw	Averag cookin time
Adzuki	1/2 to 1 inch	4 to 5 days	1/4 cup	1 cup	Soak and rinse	Yes	8 to 12 mi
Alfalfa	Seed length	1 to 2 days	1 cup	2 1/2 cups	Soak and rinse	Yes	3 to 5 min
Barley	Seed length	3 to 5 days	1/2 cup	1 cup	Soak and rinse		8 to 10 mi
Bean	1/2 to 1 1/2 inches	3 to 5 days	1/4 cup	1 1/4 cups	Soak and rinse	Yes	8 to 15 mi
Buckwheat	Seed length	2 to 4 days	1 cup	2 1/2 cups	Rinse and sprinkle only		8 to 15 mi
Cabbage, broccoli, Brussels sprout, cauliflower, and kale	1/2 to 1 inch	3 to 5 days	1/4 cup	1 1/4 cups	Soak and rinse	Yes	3 to 8 minu
Chia	1/8 to 1/2 inch	1 to 2 days	1/4 cup	1 cup	Sprinkle only	Yes	
Chickpea or garbanzo	3/4 to 1 inch	5 to 8 days	1 cup	3 1/2 cups	Soak and rinse 4 to 6 times a day	~~Yes~~ No	10 to 20 m
Cress	3/4 to 1 inch	2 to 4 days	1 tbsp.	3/4 cup	Sprinkle only	Yes	
Fenugreek	1/2 inch	3 to 4 days	1/4 cup	1 cup	Soak and rinse	Yes	2 to 4 minu
Lentil	1/4 to 1/2 inch	3 to 4 days	1 cup	2 cups	Soak and rinse		3 to 8 minu
Millet	Seed length	3 to 5 days	1 cup	2 1/2 cups	Soak and rinse		8 to 10 mir
Mung bean	1/2 to 3 inches	3 to 8 days	1 cup	4 cups	Soak and rinse	Yes	2 to 5 minu
Oat	Seed length	3 to 5 days	1 cup	2 1/2 cups	Sprinkle only		8 to 10 mir
Pea	1/4 to 1/2 inch	3 to 4 days	1 cup	2 cups	Soak and rinse		3 to 8 minu
Radish ✓	1/2 to 1 inch	2 to 4 days	1 tbsp.	3/4 cup	Soak and rinse	Yes	
Rice	Seed length	3 to 4 days	1 cup	2 1/2 cups	Soak and rinse		8 to 10 min
Rye	Seed length	3 to 5 days	1 cup	2 1/2 cups	Soak and rinse	Yes	3 to 5 minu
Sesame	Budded only	2 to 3 days	1/4 cup	1/3 cup	Soak and rinse		Oven roast
Soybean	3/4 to 1 inch	4 to 6 days	1 cup	3 1/2 cups	Soak and rinse 4 to 6 times a day	Yes	10 to 20 mi
Sunflower	Budded only	5 to 8 days	1 cup	2 cups	Soak and rinse		Oven roast
Triticale	Seed length	1 to 3 days	1 cup	3 cups	Soak and rinse	Yes	8 to 10 min
Wheat	Seed length	4 to 5 days	1 cup	4 cups	Soak and rinse	Yes	8 to 10 min

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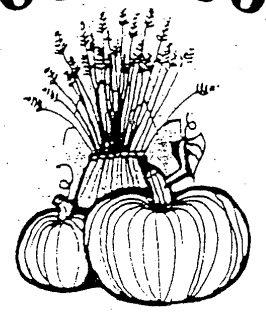
THE COMPLETE SPROUTING COOKBOOK



Karen Cross Whyte

ILLUSTRATED BY RICHARD STORTROEN

TROUBADOR PRESS SAN FRANCISCO

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For Malcolm

Published in San Francisco by Troubador Press.

Printed in the United States of America.

Library of Congress Catalog Card Number: 72-92942
ISBN: 0-912300-28-0 (Softbound)
ISBN: 0-912300-25-6 (Hardbound)

TROUBADOR PRESS
385 Fremont Street
San Francisco, California 94105

NUTRITION

Grains, seeds and nuts have played a major role in the diet of man due to the high percentage of protein found in these foods. They contain from 7 to 40 percent protein. Since grains and seeds often are used as a source of protein in the diet, it is important to know how protein is related to maintaining a healthy body.

Protein comes from the Greek word *protos,* meaning "first". Nutritionists call protein "the building blocks" of good health. Every part of the body relies on protein for proper growth and repair. The body is largely made up of protein; your skin, muscles, internal organs, nails, hair, brain and even your bones contain protein. It is the basic element in protoplasm, which is the living, jelly-like substance of every cell. Food protein provides nitrogen and amino acids for the synthesis of body protein and other nitrogen-containing substances.

Thirty-two amino acids have been discovered, but only twenty-two of them are understood. If we get eight of these amino acids in our food we can manufacture the others required. These special eight amino acids cannot be synthesized and are thus called "essential." They must be provided in adequate amounts by dietary protein. The eight essential amino acids are isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. Excess protein serves only as a source of energy.

Most legumes, grains and nuts contain the essential amino acids. Some, however, are low in one or more essential amino acids. In order to make full use of any food protein the amino acids must be properly balanced. Such balanced proteins are called "complete." Proteins that

contain insufficient amounts of any of the essential amino acids are called "incomplete" or "limited." When two or more kinds of seeds containing "limited" protein are eaten at the same meal one may supply the amino acid lacking in the other; together they become a "complete" protein. For example, corn has a small amount of lysine and a large amount of methionine while beans are rich in lysine and somewhat deficient in methionine. Corn tortillas and beans served together provide a balanced combination of essential amino acids.

Dr. W. R. Aykrod, a nutritional director, states that "in the raw state, many legumes contain substances which are indigestible or even antagonistic to digestion such as saponins, glycosides, alkaloids, conjugates of protein with phytin or hemicellulose, and substances which inhibit the action of the digestive enzyme, trypsin." Mature raw legumes or legumes not properly prepared for consumption may in fact be poisonous and contain a good deal of indigestible material. Adequate soaking, sprouting, prolonged cooking, mashing and a variety of fermentation procedures have been used since ancient times to remove toxins from legumes and enhance their digestibility. Germination is one of the best methods of preparation and allows the whole seed to be eaten in a palatable form. Legumes also lose their objectionable gas generating quality when sprouted.

It is generally agreed by nutritionists that foods high in water content are more easily broken down and assimilated by the body. Seeds are concentrated foods in the sense that they have low water content. Most seeds are about 12 percent water; when sprouted the water content may increase to as much as 95 percent.

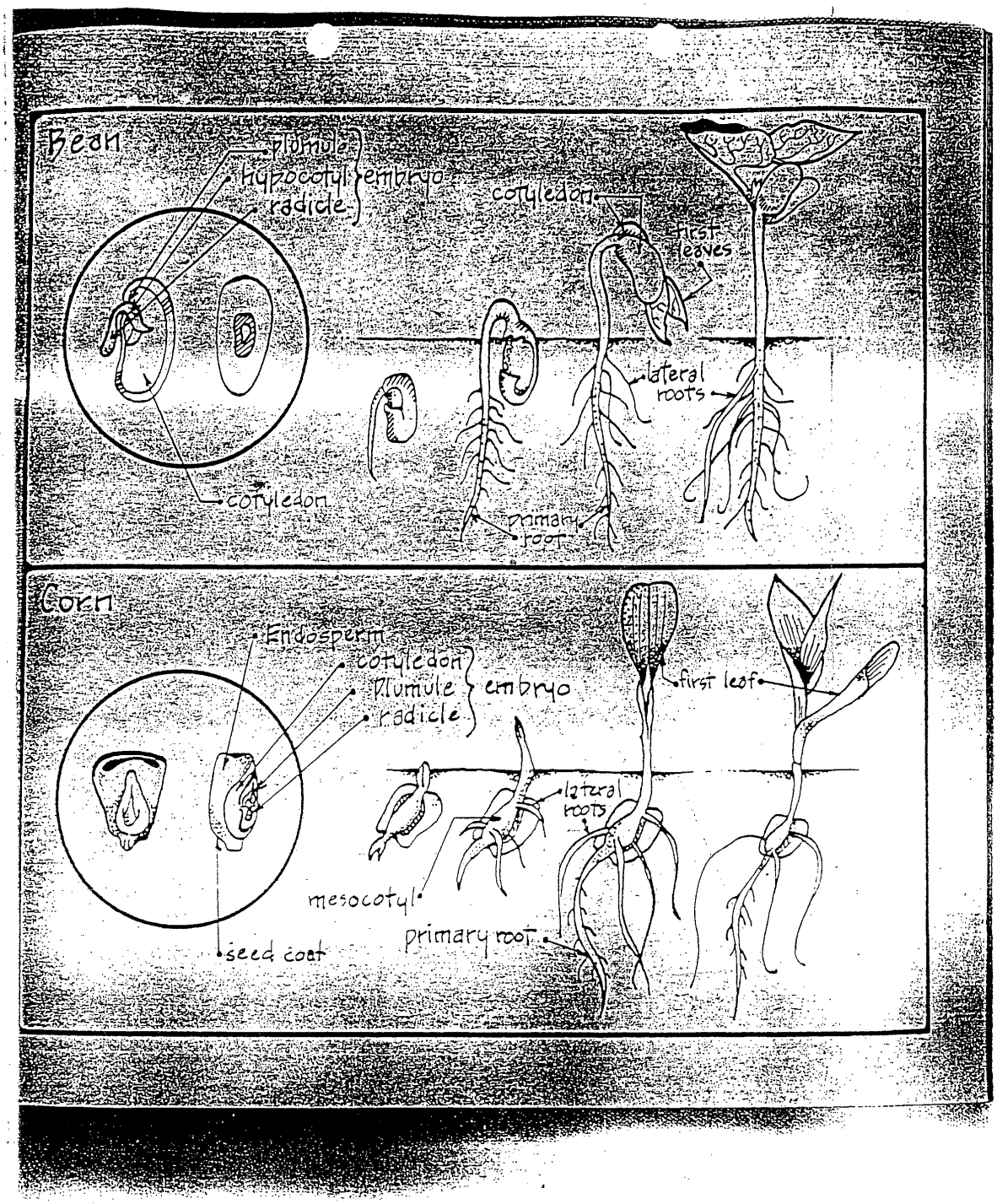
The process of sprouting seeds creates a more usable form of protein in many seeds. Sprouting also stimulates other beneficial changes. One

impressive change is the increasing of vitamin C which takes place during sprouting of seeds. The vitamin C in oats increases 600 percent after sprouting. The knowledge that sprouts could cure and prevent scurvy was available in 1782, long before ascorbic acid was discovered and labeled vitamin C in 1920.

Dr. Paul Burkholder of Yale University tested the nutritional contents of oat sprouts. He found that the sprouted oats contained 500 percent more nicotinic acid, biotin had increased 50 percent, pantothenic acid 200 percent, pyridoxine (B6) 500 percent, folic acid 600 percent, inositol 100 percent, thiamine (B1) 10 percent, and vitamin B2, 1350 percent.

Other studies of seeds and grains have yielded equally dramatic results. Dr. Chattepadhyay and his associates in Calcutta tested mung beans, lentils, peas, corn, rice and wheat for their vitamin E content. As a result of sprouting, the vitamin E content had increased up to 33 percent during a period of from two to four days. Vitamin A had increased in some seeds after sprouting for four days.

Even though complete research on the nutritional content of all sprouted seeds has not been made, there is more than enough scientific evidence available to conclude that sprouting a seed enhances its already high nutritional value.


Bean
plumule
hypocotyl
radicle
embryo
cotyledon
first leaves
lateral roots
cotyledon
primary root
Corn
Endosperm
cotyledon
plumule
radicle
embryo
first leaf
lateral roots
mesocotyl
primary root
seed coat

FROM SEEDS TO SPROUTS

A seed is a miniature plant in an arrested state of development. Its primary function is to propagate its species. Carbohydrates, proteins and fats are stored within the seed as a source of available nutrition when growth resumes. This storehouse of food is also nutritious for man. During the germination process, stored food is changed into a more usable form for both the plant and man.

The dry seed, when its activities are at a minimum, is in a dormant condition. Its food is held in reserve until the time and place are suitable for the start of new growth. Each species has its own built-in protection against heat, cold, drought and water. When the temperature, oxygen, light and moisture requirements are met, the seed will germinate. Sometimes a seed will wait several years for the right climatic combination before starting growth.

The outward appearance of seeds varies greatly in color, size, shape and form. Most plants can be identified by their seeds alone. The basic structure of all seeds is similar. Food reserve supplies are accumulated in the *endosperm*, (nourishment which surrounds the embryo) of corn and grains. These plants are called *monocots* (plants with single seed leaves). In *dicots* (plants with two seed leaves) such as beans and peas, the endosperm is absorbed by the *cotyledons* (seed leaves). The cotyledons serve as the food storage organ. The chief activity of the cotyledon and endosperm is the digestion and translocation of its reserve food to the embryo, which is the rudimentary growing part of the seed. Translocation is a process by which the sugars and amino acids move to the embryo for utilization in its growth and development.

The first step toward germination is the absorbing of water by the seed. This process is called imbibition. The seed coat is softened by the water, allowing the embryo and endosperm or cotyledon to "plump" itself with moisture. As the seed continues to swell, the seed coat is ruptured, freeing the embryo for continued development.

Dry seeds contain approximately 5 to 12 percent water. This proportion is increased up to 70 percent after a preliminary soaking of 12 hours. The amount of moisture around a seed affects the amount of oxygen available to it.

Respiration in dry seeds is extremely slow. Respiration is the metabolic process by which a plant or animal oxidizes its food materials. This process provides the living system with the energy it requires for the synthesis of new raw material and growth. After a definite amount of water is absorbed, a marked increase in seed respiration occurs. Even before we can see any growth, this increase of respiration is releasing energy for sprouting. As growth proceeds, the increasing demand for energy materials and new tissue is met by the digestion of reserve food. Starch is digested into sugar, lipids (oils) are changed to soluble compounds and storage proteins become amino acids.

The first visible evidence of germination is the breaking of the root tip through the seed covering. The growth of the primary root prior to the growth of the stem and leaves is nature's way of anchoring the seed and providing for further water absorption. Stem and leaf development follow. The seed becomes a little plant independent enough to absorb outside nourishment.

The temperature range for germinating seeds is generally between 32° and 113° F. A low percentage of germination may be expected at either extreme. For most crop plants, the optimum temperature lies between

68° and 86° F.; however, peas, lettuce, radishes, rye, barley and wheat will germinate readily at temperatures as low as 50° F.

Light does not influence the germination of most kinds of seeds, but germination of some is controlled by the presence or absence of light. Light also affects the flavor and the amount of chlorophyll contained in sprouts. Alfalfa, cress and other types of leafy sprouts should be "greened" in light for more chlorophyll and better flavor. Beans and sunflower seeds are more tasty if grown in the dark. In some seeds, exposure to light during the sprouting process inhibits the development of vitamin C.

Some sprouts should be harvested before the first leaves are fully developed. Sunflower seeds, for example, are tastiest when the root is only as long as the seed. Wheat and other grains are also best when the leaves are underdeveloped and the root is short. Alfalfa sprouts, however, should be between 2 and 2½ inches with 2 green leaves. Fenugreek may have roots as long as 3 inches. To prevent further growth, store sprouts in the refrigerator when they reach the desired length.